(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 665 777 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
30.05.2007 Bulletin 2007/22

(21) Application number: **04784006.1**

(22) Date of filing: **13.09.2004**

(51) Int Cl.:
H04N 5/235 (2006.01) ***G03B 15/05*** (2006.01)

(86) International application number:
PCT/US2004/030002

(87) International publication number:
WO 2005/029848 (31.03.2005 Gazette 2005/13)

(54) **ELECTRONIC CAMERA AND METHOD WITH FILL FLASH FUNCTION**

ELEKTRONISCHE KAMERA UND VERFAHREN MIT FÜLLBLITZFUNKTION

APPAREIL PHOTO ELECTRONIQUE ET PROCEDE A FONCTION FLASH DE REMPLISSAGE

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR

(30) Priority: **15.09.2003 US 662763**

(43) Date of publication of application:
07.06.2006 Bulletin 2006/23

(73) Proprietor: **Senshin Capital, LLC**
Wilmington, DE 19808 (US)

(72) Inventor: **STALLER, Norman, D.**
Beverly, MA 01915 (US)

(74) Representative: **Epping - Hermann - Fischer**
Postfach 20 07 34
80007 München (DE)

(56) References cited:
US-A- 4 345 828
US-A- 4 941 011
US-A- 6 081 076
US-A1- 2002 081 111

EP 1 665 777 B1

Description

Field of the Invention

[0001] The present invention generally relates to electronic image capture and particularly to a fill flash function for such electronic image capture.

Background of the Invention

[0002] Electronic imaging devices, such as those used in digital cameras, typically perform image capture differently from film based cameras. Electronic image capture devices typically integrate separate output signals from each photosensitive semiconductor pixel of an array of pixels. An image capture is typically initiated by simultaneously zeroing all of the integration values of the pixels, and various approaches have been used for terminating the image capture process. Such integrated values then need to be read out from each of the array pixels. Problems occur in controlling the amount of time over which each of the pixels continues to integrate sensed light signals.

[0003] Controlling the integration of such imaging devices is further complicated by the attempt to control a fill flash function, wherein a flash unit is used for part of the illumination of a scene including a near field object of limited brightness and a far field background of greater brightness. Such image capture and pixel integration is still further complicated by the additional need to achieve the proper balance of illumination between natural and artificial, or flash, light sources.

US2002081111 discloses a camera for simultaneously capturing electronic and film images and having mechanical shutters. The scene brightness is detected by a separate ambient sensor. Based on the scene brightness the flash is controlled.

Summary of the Invention

[0004] One embodiment of the present invention provides an electronic camera, including an electronic image capture device adapted for capturing an image scene, a scanning aperture shutter located to control light energy received by the electronic image capture device from the image scene, a photocell adapted for sensing light energy received from the image scene, wherein the scanning aperture shutter is able is able to control said sensed light energy; and an exposure control system responsive to the photocell and operatively connected to the scanning aperture shutter, wherein the exposure control system is adapted to control the scanning aperture shutter and a flash unit in response to sensed light energy at the photocell to control an amount of fill flash energy in relation to ambient light energy received by the electronic image capture device during image capture.

[0005] The exposure control system may be adapted to illuminate the flash unit once a predetermined amount of ambient light energy is sensed by the photocell, and also to extinguish the flash unit once a predetermined amount of infrared spectrum energy is sensed by the photocell during flash unit illumination.

[0006] The photocell may include a visible spectrum photocell and an infrared spectrum photocell, and the exposure control system may adapted to use the visible spectrum photocell to sense ambient light energy received from the image scene prior to illumination by the flash unit and to use the infrared photocell for sensing infrared spectrum energy received from the image scene during illumination by the flash unit. Also, the scanning aperture shutter may include separate apertures for the image capture device, the visible spectrum photocell and the infrared spectrum photocell.

[0007] The exposure control system may be adapted to generate control signals for a detachable flash unit, or the flash unit may be constructed integrally with the camera.

[0008] The flash unit may be oriented to illuminate the image scene, the photocell may be adapted for sensing visible spectrum energy and infrared spectrum energy received from the image scene, and the exposure control system responsive to the photocell may be operatively connected to the scanning aperture shutter and the flash unit, wherein the exposure control system is adapted to control an amount of fill flash energy received from the image scene in relation to visible ambient light energy received from the image scene during image capture by illuminating the flash unit once a predetermined amount of ambient visible spectrum energy is sensed by the photocell and by extinguishing the flash unit once a predetermined amount of infrared energy is sensed by the photocell.

[0009] The visible spectrum and infrared spectrum photocells may be separate devices, and the shutter may include separate, proportionately operable, variable apertures for the image capture device and the photocell. Also, the flash unit may be a quenchable strobe light.

[0010] Yet another embodiment of the present invention provides a method for electronic image capture using a fill flash function, comprising the steps of using a scanning aperture shutter to control light energy received by an electronic image capture device, sensing visible ambient light energy and infrared energy received from an image scene, and controlled by said scanning aperture shutter; and controlling the scanning aperture shutter and a flash unit during image capture in response to the sensing to cause a predetermined ratio of fill flash light energy to ambient light energy to be received by the electronic image capture device including illuminating the flash unit once a predetermined amount of ambient light energy is sensed during image capture.

[0011] The step of sensing may use an infrared spectrum photocell for sensing infrared energy received from the image scene during illumination by the flash unit, and further may use a visible light spectrum photocell for sensing ambient light energy received from the image

scene before illumination by the flash unit.

[0012] The step of controlling may include extinguishing the flash unit once a predetermined amount of infrared spectrum energy is sensed during flash unit illumination. Also, scanning aperture shutter may include separate, proportionately operable, variable apertures for image capture and the step of sensing.

Brief Description of the Drawings

[0013] The present invention is illustratively shown and described in reference to the accompanying drawings, in which:

[0014] Fig. 1 is a representational side view diagram of an electronic camera constructed in accordance with one embodiment of the present invention as it would be used for image capture;

[0015] Fig. 2 is a representational front view of a blade shutter suitable for use with the camera of Fig. 1;

[0016] Fig. 3 is a representational front view of another blade shutter suitable for use with the camera of Fig. 1; and

[0017] Fig. 4 is a graph of light energy captured by the camera of Fig. 1, verses time.

Detailed Description Of The Drawings

[0018] Fig. 1 shows an electronic camera 10 generally including an electronic image capture device 12, a scanning aperture shutter 14, imaging optics 16, a photocell 18 and an exposure control system 20. Attached to camera 10 is a removable flash unit 22. Camera 10 forms an electronic image capture system by using imaging optics 16, such as a lens, to focus an image scene of received light from a field of view 24, on image capture device 12. Scanning aperture shutter 14 is located between imaging optics 16 and image capture device 12 to control the amount of image light received by image capture device 12.

[0019] Photocell 18 is directed to sense light energy received from a substantially similar field of view 26, as determined by a separate optical element 28. Light energy received by photocell 18 passes through, and is likewise controlled by shutter 14. In this manner, the light energy sensed by photocell 18 is analogous to the light energy received by image capture device 12.

[0020] Exposure control system 20 is coupled to photocell 18 and is adapted to responsively control shutter 14 and image capture device 12 to control the amount of light energy received from flash unit 22 during image capture.

[0021] Image capture device 12 may be constructed in any suitable manner, such as in the form of a CCD, which is the best available embodiment at the time of this application. Also, although flash unit 22 is shown as a removable attachment to camera 10, it may also be constructed as an integral part of camera 10, as represented by phantom lines 23.

[0022] As is frequently the case, an image scene 30 may include a near-field object 32 set against a far-field background 34, wherein the natural illumination of far-field background 34 is greater than that of near-field object 32. In this case, a fill flash function is used to provide greater illumination to the near-field object 32 and thereby balance the lighting of the entire photo for better composition. Fill flash is even more frequently used to minimize shadow areas in near field objects. For these purposes, exposure control system 20 is adapted to control the amount of fill flash energy received from flash unit 22 in relation to ambient light energy received during an image capture.

[0023] Fig. 2 is a representational front view of one form of scanning aperture shutter 14, called a blade shutter, which may be used with the camera 10 (Fig. 1). Shutter 14 typically includes a pair of rigid shutter blades 40, 42, which are adapted for relative lateral movement in the direction of arrows 44 by means of an electromechanical actuator 45. Front blade shutter 40 includes apertures 46, 48, and rear blade shutter 42 includes apertures 47, 49, shown in phantom. Aperture pair 46, 47 are intended for image capture and are aligned with image capture device 12 (Fig 1). Aperture pair 48, 49 are intended for exposing photocell 18 (Fig. 1) to incident image light energy and are therefore intended to be aligned with photocell 18.

[0024] The relative lateral movement of shutter blades 40, 42 causes aperture pairs 46, 47 and 48, 49 to progressively overlap and thereby increase the aperture size for incident light energy. The separate aperture pairs 46, 47 and 48, 49 are proportionately sized so that any relative positioning of shutter blades 40, 42 results in generally the same proportion of light energy emitted through aperture pairs 46, 47 and 48, 49. Thus, the amount of light energy sensed by photocell 18 generally represents the same proportion of the light energy emitted through aperture pair 46, 47, regardless of the position of shutter blades 40, 42. In this manner, shutter 14 includes separate, proportionately operable, variable apertures 46, 47 and 48, 49 for image capture device 12 and photocell 18. The art of constructing blade shutters is well developed and many variations from the art may be used with the present invention. Although lateral movement of shutter blades 40, 42 is described, alternative forms of movement, such as rotational, may be used. Likewise, relative shapes and sizes may be varied in accordance with known methods. Although Fig. 2, depicts a single photocell aperture, more than one may be used, and their orientation may vary.

[0025] Fig. 3 shows a front view of another pair of blade shutters 50, 52, which include an aperture pair 54, 55 for image capture and separate aperture pairs 56, 57 and 58, 59 to accommodate a visible spectrum photocell 60 and an infrared spectrum photocell 62, respectively. Aperture pair 56, 57 are associated with a monitoring aperture pair 64, which is shown as a single aperture, but is actually a separate aperture in each aperture blade 50,

52. Monitoring aperture pair 64 is designed to be open while aperture pair 54, 55 is closed to allow ambient light monitoring of an image scene prior to image capture. Both aperture pairs 56, 57 and 58, 59 are shaped to provide an analogous representation of the opening of image capture aperture pair 54, 55. The relative orientation of the aperture pairs varies between Figs. 2 and 3 as the orientation of image capture device 12 and photocell 18 may vary in the embodiment of Fig. 1.

[0026] Thus any suitable arrangement of apertures may be used, depending upon the specific photocell arrangement employed. Photocell 18 may take any suitable form such as separate visible spectrum and infrared spectrum photocells, or a single unit adapted to separately sense visible and infrared spectrum energy.

[0027] Fig. 4 is a graph, over the exposure time of an image capture, of the amount of light energy admitted through image capture aperture pair 46, 47 (Fig. 2) to thereby form an image on image capture device 12 (Fig. 1). Fig. 4 represents the operation of camera 10 (Fig. 1) in the fill flash mode, wherein the total light energy used for image capture is a mixed proportion of ambient scene illumination and fill flash. As mentioned, photocell 18 senses an analogous amount of received light during image capture. Whereas the instantaneous value of curve 68 represents the light level being received, the area 70, 72 under the graph represents the amount of light energy received over time. In this manner, by monitoring and integrating the output of photocell 18, exposure control system 20 can determine, in real time, the amount of image capture light energy incident upon image capture device 12.

[0028] A well known fill flash function typically uses ambient scene illumination to provide approximately 75% of the image capture light energy and the fill flash function to provide the remaining 25 % of image capture energy. This distribution may be varied by image scene. For controlling this distribution, exposure control system 20 monitors and integrates the output of photocell 18 until the integrated area 70 under curve 68 reaches approximately 70% of the necessary amount of image capture light energy. At this point 74, flash unit 22 is illuminated and the amount of incident light energy sensed by photocell 18 increases, very steeply. At some point 76, exposure control system 20 determines that 90 to 95% of the desired image capture light energy has been received and exposure control system 20 quenches flash 22 and closes shutter 14. In a this manner, flash unit 22 may have a variable light output, and exposure control system 20 may be adapted to limit such variable light output in response to light energy sensed by photocell 18.

[0029] The rising slope of the left side of curve 68 represents the increasing aperture size of a scanning aperture shutter. It can be appreciated, that in low-light image scenes, the scanning aperture shutter may open to its maximum aperture before approximately 70% of the image capture energy has been sensed or received. In this situation, exposure control system 20 may be programmed to illuminate flash unit 22 to allow the 25% flash contribution to be collected. Shutter 14 may subsequently be left open after flash unit 22 is quenched, so that ambient light is further admitted to reach the preferred distribution. Ambient light received during flash illumination may not be measurable because of visible spectrum flash illumination, but it may be factored into the measurement.

[0030] It is known in flash unit technology that the amount of infrared flash energy reflected by objects is more consistent between various objects than the amount of visible spectrum energy. For this reason, the present invention preferably uses an infrared photocell for measuring image scene energy during flash illumination, and those measurements are converted to appropriate visible spectrum values or otherwise factored into the overall light measurement in accordance with methods known in the art. The art of exposure control devices for cameras is well developed, and various physically different devices may be constructed in accordance with known methods to implement the functions of the exposure control system of the present invention.

[0031] The present invention is illustratively described above in reference to the disclosed embodiments. Various modifications and changes may be made to the disclosed embodiments by persons skilled in the art without departing from the scope of the present invention as defined in the appended claims.

Claims

1. An electronic camera, comprising:

   - an electronic image capture device (12) adapted for capturing an image scene (30);
   - a scanning aperture shutter (14) located to control light energy received by said electronic image capture device (12) from said image scene (30);
   - a photocell (18) adapted for sensing light energy received from said image scene (30), wherein the scanning aperture shutter (14) is able to control said sensed light energy; and
   - an exposure control system (20) responsive to said photocell (18) and operatively connected to said scanning aperture shutter (14),
   - wherein said exposure control system (20) is adapted to control said scanning aperture shutter (14) and a flash unit (22) in response to sensed light energy at said photocell (18) to control an amount of fill flash energy received by said electronic image capture device in relation to ambient light energy received by said electronic image capture device during image capture.

2. The camera of claim 1, wherein said exposure control system (20) is adapted to illuminate said flash

unit (22) once a predetermined amount of ambient light energy is sensed by said photocell (18).

3. The camera of claim 2, wherein said exposure control system (20) is adapted to extinguish said flash unit (22) once a predetermined amount of infrared spectrum energy is sensed by said photocell (18) during flash unit illumination.

4. The camera of claim 1, wherein said photocell (18) includes a visible spectrum photocell and an infrared spectrum photocell, and further wherein, said exposure control system (20) is adapted to use said visible spectrum photocell to sense ambient light energy received from said image scene (30) prior to illumination by said flash unit (22) and to use infrared photocell for sensing infrared spectrum energy received from said image scene (30) during illumination by said flash unit (22).

5. The camera of claim 4, wherein said scanning aperture shutter (14) includes separate apertures for said image capture device (12), said visible spectrum photocell and said infrared spectrum photocell.

6. The camera of claim 1, wherein said exposure control system (20) is adapted to generate control signals for a detachable flash unit (22).

7. The camera of claim 1, wherein said flash unit (22) is constructed integrally with said camera.

8. The camera of claim 1, wherein:

   - said flash unit (22) is oriented to illuminate said image scene (30);
   - said photocell (18) is adapted for sensing visible spectrum energy and infrared spectrum energy received from said image scene (30); and
   - said exposure control system (20) responsive to said photocell (18) is operatively connected to said scanning aperture shutter (14) and said flash unit (22); and
   - wherein said exposure control system (20) is adapted to control an amount of fill flash energy received from said image scene (30) in relation to visible ambient light energy received from said image scene (30) during image capture by illuminating said flash unit (22) once a predetermined amount of ambient visible spectrum energy is sensed by said photocell (18) and by extinguishing said flash unit (22) once a predetermined amount of infrared energy is sensed by said photocell (18).

9. The camera of claim 8, wherein said visible spectrum and infrared spectrum photocells are separate devices.

10. The camera of one of the claims 8 or 9, wherein said scanning aperture shutter (14) includes separate, proportionately operable, variable apertures for said image capture device (12) and said photocell (18).

11. The camera of one of the claims 8 to 10, wherein said flash unit (22) is a quenchable strobe light.

12. A method for electronic image capture using a fill flash function, comprising the steps of:

   - using a scanning aperture shutter (14) to control light energy received by an electronic image capture device (12);
   - sensing visible ambient light energy and infrared energy received from an image scene (30) and controlled by said scanning aperture shutter (14); and
   - controlling said scanning aperture shutter (14) and a flash unit (22) during image capture in response to said sensing to cause a predetermined ratio of fill flash light energy to ambient light energy to be received by said electronic image capture device (12) including illuminating said flash unit (22) once a predetermined amount of ambient light energy is sensed during image capture.

13. The method of claim 12, wherein said step of sensing uses an infrared spectrum photocell (18) for sensing infrared energy received from said image scene (30) during illumination by said flash unit (22).

14. The method of claim 13, wherein said step of sensing uses a visible light spectrum photocell for sensing ambient light energy received from said image scene (30) before illumination by said flash unit (22).

15. The method of claim 12, wherein said scanning aperture shutter (14) includes separate, proportionately operable, variable apertures for image capture and said step of sensing.

16. The method of claim 12, wherein said step of controlling includes extinguishing said flash unit (22) once a predetermined amount of infrared spectrum energy is sensed during flash unit illumination.

Patentansprüche

1. Elektronische Kamera, umfassend:

   - eine elektronische Bilderfassungsvorrichtung (12), die angepasst ist, eine Bildszene (30) zu erfassen;
   - einen Abtastblendenverschluss (14), der angeordnet ist, um die von der elektronischen Bil-

derfassungsvorrichtung (12) von der Bildszene (30) empfangene Lichtenergie zu steuern;
- eine Fotozelle (18), die angepasst ist, Lichtenergie zu messen, die von der Bildszene (30) empfangen wird, wobei der Abtastblendenverschluss (14) in der Lage ist, die gemessene Lichtenergie zu steuern; und
- ein Belichtungssteuerungssystem (20), das auf die Fotozelle (18) reagiert und wirksam mit dem Abtastblendenverschluss (14) gekoppelt ist,
- wobei das Belichtungssteuerungssystem (20) angepasst ist, den Abtastblendenverschluss (14) und eine Blitzeinheit (22) als Reaktion auf die an der Fotozelle (18) gemessene Lichtenergie zu steuern, um eine Menge an Aufhellblitzenergie zu steuern, die von der elektronischen Bilderfassungsvorrichtung empfangen wird und zwar in Abhängigkeit von der von der elektronischen Bilderfassungsvorrichtung bei der Bilderfassung empfangenen Umgebungslichtenergie.

2. Kamera nach Anspruch 1, wobei das Belichtungssteuerungssystem (20) angepasst ist, die Blitzeinheit (22) einzuschalten, sobald eine vorher festgelegte Menge von Umgebungslichtenergie von der Fotozelle (18) gemessen wird.

3. Kamera nach Anspruch 2, wobei das Belichtungssteuerungssystem (20) angepasst ist, die Blitzeinheit (22) auszuschalten, sobald eine vorher festgelegte Menge Energie im Infrarotspektrum von der Fotozelle (18) bei der Beleuchtung durch die Blitzeinheit gemessen wird.

4. Kamera nach Anspruch 1, wobei die Fotozelle (18) eine Fotozelle für das sichtbare Spektrum und eine Fotozelle für das Infrarotspektrum enthält und wobei weiterhin das Belichtungssteuerungssystem (20) angepasst ist, die Fotozelle für das sichtbare Spektrum zur Messung der von der Bildszene (30) empfangenen Umgebungslichtenergie vor der Ausleuchtung durch die Blitzeinheit (22) zu benutzen und die Infrarot-Fotozelle zur Messung der bei der Beleuchtung durch die Blitzeinheit (22) von der Bildszene (30) empfangenen Energie des Infrarotspektrums zu benutzen.

5. Kamera nach Anspruch 4, wobei der Abtastblendenverschluss (14) getrennte Blenden für die Bilderfassungsvorrichtung (12), die Fotozelle für das sichtbare Spektrum und die Fotozelle für das Infrarotspektrum enthält.

6. Kamera nach Anspruch 1, wobei das Belichtungssteuerungssystem (20) angepasst ist, Steuersignale für eine abnehmbare Blitzeinheit (22) zu erzeugen.

7. Kamera nach Anspruch 1, wobei die Blitzeinheit (22) fest in die Kamera eingebaut ist.

8. Kamera nach Anspruch 1, wobei:

- die Blitzeinheit (22) ausgerichtet ist, die Bildszene (30) zu beleuchten;
- die Fotozelle (18) angepasst ist, die von der Bildszene (30) empfangene Energie des sichtbaren Spektrums und die Energie des Infrarotspektrums zu messen; und
- das Belichtungssteuerungssystem (20), das auf die Fotozelle (18) reagiert, wirksam mit dem Abtastblendenverschluss (14) und der Blitzeinheit (22) verbunden ist; und
- wobei das Belichtungssteuerungssystem (20) angepasst ist, in Abhängigkeit von der bei der Bilderfassung von der Bildszene (30) empfangenen Umgebungslichtenergie eine Menge der von der Bildszene (30) empfangenen Aufhellblitzenergie zu steuern, indem die Blitzeinheit (22) erleuchtet wird, sobald eine vorher festgelegte Menge von Umgebungslichtenergie im sichtbaren Spektrum von der Fotozelle (18) gemessen wird, und indem die Blitzeinheit (22) ausgeschaltet wird, sobald eine vorher festgelegte Menge Infrarotenergie von der Fotozelle (18) gemessen wird.

9. Kamera nach Anspruch 8, wobei die Fotozellen für das sichtbare Spektrum und das Infrarotspektrum getrennte Vorrichtungen sind.

10. Kamera nach einem der Ansprüche 8 oder 9, wobei der Abtastblendenverschluss (14) getrennte, proportional zu betätigende, variable Blenden für die Bilderfassungsvorrichtung (12) und die Fotozelle (18) enthält.

11. Kamera nach einem der Ansprüche 8 bis 10, wobei die Blitzeinheit (22) ein löschbares Stroboskoplicht ist.

12. Verfahren zur elektronischen Bilderfassung unter Verwendung einer Aufhellblitzfunktion, das folgende Schritte umfasst:

- Verwendung eines Abtastblendenverschlusses (14) zur Steuerung der von einer elektronischen Bilderfassungsvorrichtung (12) empfangenen Lichtenergie;
- Messung der Energie des sichtbaren Umgebungslichtes und der Energie des Infrarotlichtes, die von einer Bildszene (30) empfangen und vom Abtastblendenverschluss (14) gesteuert werden; und
- Steuerung des Abtastblendenverschlusses (14) und einer Blitzeinheit (22) bei der Bilderfas-

sung als Reaktion auf die Messung, um zu bewirken, dass ein vorher festgelegtes Verhältnis von Aufhellblitzenergie zur Umgebungslichtenergie von der elektronischen Bilderfassungsvorrichtung (12) empfangen wird, was das Erleuchten der Blitzeinrichtung (22) umfasst, sobald eine vorher festgelegte Menge an Umgebungslichtenergie bei der Bilderfassung gemessen wurde.

13. Verfahren nach Anspruch 12, wobei im Schritt der Messung eine Fotozelle für das Infrarotspektrum (18) verwendet wird, um die von der Bildszene (30) bei der Beleuchtung durch die Blitzeinheit (22) empfangene Infrarotenergie zu messen.

14. Verfahren nach Anspruch 13, wobei im Schritt der Messung eine Fotozelle für das sichtbare Spektrum verwendet wird, um die von der Bildszene (30) vor der Beleuchtung durch die Blitzeinheit (22) empfangene Energie des Umgebungslichtes zu messen.

15. Verfahren nach Anspruch 12, wobei der Abtastblendenverschluss (14) getrennte, proportional zu betätigende, variable Blenden für die Bilderfassung und den Schritt der Messung enthält.

16. Verfahren nach Anspruch 12, wobei der Schritt der Steuerung das Ausschalten der Blitzeinheit (22) umfasst, wenn eine vorher festgelegte Menge Energie im Infrarotspektrum bei der Beleuchtung durch die Blitzeinheit gemessen wird.

Revendications

1. Appareil photo électronique, comportant :

■ un dispositif électronique de capture d'images (12) adapté pour capturer une scène d'image (30) ;
■ un obturateur d'ouverture d'exploration (14) disposé de manière à réguler l'énergie lumineuse reçue par ledit dispositif électronique de capture d'images (12) à partir de ladite scène d'image (30) ;
■ une cellule photosensible (18) adaptée pour capter l'énergie lumineuse reçue à partir de ladite scène d'image (30), sachant que l'obturateur d'ouverture d'exploration (14) est capable de réguler ladite énergie lumineuse captée, et
■ un système de commande d'exposition (20) réagissant à ladite cellule photosensible (18) et relié fonctionnellement audit obturateur d'ouverture d'exploration (14),
■ dans lequel ledit système de commande d'exposition (20) est adapté pour commande ledit obturateur d'ouverture d'exploration (14) et une unité de flash (22) en réponse à l'énergie lumineuse captée à ladite cellule photosensible (18) pour réguler une quantité d'énergie de flash d'appoint reçue par ledit dispositif électronique de capture d'images en relation avec l'énergie lumineuse ambiante reçue par ledit dispositif électronique de capture d'images lors de la capture d'images.

2. Appareil photo selon la revendication 1, dans lequel ledit système de commande d'exposition (20) est adapté pour allumer ladite unité de flash (22) une fois qu'une quantité prédéterminée d'énergie lumineuse ambiante est captée par ladite cellule photosensible (18).

3. Appareil photo selon la revendication 2, dans lequel ledit système de commande d'exposition (20) est adapté pour éteindre ladite unité de flash (22) une fois qu'une quantité prédéterminée d'énergie lumineuse du spectre infrarouge est captée par ladite cellule photosensible (18) pendant la durée d'allumage de ladite unité de flash.

4. Appareil photo selon la revendication 1, dans lequel ladite cellule photosensible (18) comporte une cellule photosensible pour le spectre visible et une cellule photosensible pour le spectre infrarouge, et dans lequel ledit système de commande d'exposition (20) est adapté pour utiliser ladite cellule photosensible pour le spectre visible pour capter l'énergie lumineuse ambiante reçue de ladite scène d'image (30) avant l'illumination par ladite unité de flash (22) et pour utiliser ladite cellule photosensible pour le spectre infrarouge pour capter l'énergie lumineuse infrarouge reçue de ladite scène d'image (30) lors de l'illumination par ladite unité de flash (22).

5. Appareil photo selon la revendication 4, dans lequel ledit obturateur d'ouverture d'exploration (14) comporte des ouvertures séparées pour ledit dispositif de capture d'images (12), ladite cellule photosensible pour le spectre visible et ladite cellule photosensible pour le spectre infrarouge.

6. Appareil photo selon la revendication 1, dans lequel ledit système de commande d'exposition (20) est adapté pour générer des signaux de commande pour une unité de flash détachable (22).

7. Appareil photo selon la revendication 1, dans lequel ladite unité de flash (22) est construite comme partie intégrale de l'appareil photo.

8. Appareil photo selon la revendication 1, dans lequel :

■ ladite unité de flash (22) est orientée pour illuminer ladite scène d'image (30) ;

■ ladite cellule photosensible (18) est adaptée pour capter l'énergie du spectre visible et l'énergie du spectre infrarouge reçues de ladite scène d'image (30), et

■ ledit système de commande d'exposition (20) réagissant à ladite cellule photosensible (18) est relié fonctionnellement audit obturateur d'ouverture d'exploration (14) et à ladite unité de flash ; et

■ dans lequel ledit système de commande d'exposition (20) est adapté pour réguler une quantité d'énergie de flash d'appoint reçue de ladite scène d'image (30) en relation avec l'énergie lumineuse ambiante visible reçue de ladite scène d'image (30) lors de la capture d'images en allumant ladite unité de flash (22) aussitôt qu'une quantité prédéterminée d'énergie du spectre visible ambiant est captée par ladite cellule photosensible (18) et en éteignant ladite unité de flash (22) aussitôt qu'une quantité prédéterminée d'énergie infrarouge est captée par ladite cellule photosensible (18).

9. Appareil photo selon la revendication 8, dans lequel lesdites cellules photosensibles pour le spectre visible et pour le spectre infrarouge sont des dispositifs séparés.

10. Appareil photo selon l'une quelconque des revendications 8 ou 9, dans lequel ledit obturateur d'ouverture d'exploration (14) comporte des ouvertures séparées, utilisables proportionnellement et variables pour ledit dispositif de capture d'images (12) et pour ladite cellule photosensible (18).

11. Appareil photo selon l'une quelconque des revendications 8 à 10, dans lequel ladite unité de flash (22) est un feu à éclats coupable.

12. Méthode pour la capture électronique d'images en utilisant une fonctionnalité de flash d'appoint, comportant les étapes :

■ d'utilisation d'un obturateur d'ouverture d'exploration (14) pour réguler l'énergie lumineuse reçue par un dispositif électronique de capture d'images (12) ;

■ de détection de l'énergie lumineuse visible ambiante et l'énergie lumineuse infrarouge reçues à partir d'une scène d'image (30) et régulées par ledit obturateur d'ouverture d'exploration (14), et

■ de commande dudit obturateur d'ouverture d'exploration (14) et d'une unité de flash 822) lors de la capture d'images en réponse à ladite détection pour générer un rapport prédéterminé d'énergie lumineuse de flash d'appoint et d'énergie de lumière ambiante, lequel rapport est reçu par le dispositif électronique de capture d'images (12), comprenant l'allumage de l'unité de flash aussitôt qu'une quantité prédéterminée d'énergie lumineuse ambiante est détectée lors de la capture d'images.

13. Méthode selon la revendication 12, dans laquelle ladite étape de détection utilise une cellule photosensible (18) pour le spectre infrarouge pour la détection de l'énergie infrarouge reçue de ladite scène d'image (30) lors de l'illumination par ladite unité de flash (22).

14. Méthode selon la revendication 13, dans laquelle ladite étape de détection utilise une cellule photosensible pour le spectre de lumière visible pour la détection de l'énergie lumineuse ambiante reçue de ladite scène d'image (30) avant l'illumination par ladite unité de flash (22).

15. Méthode selon la revendication 12, dans laquelle ledit obturateur d'ouverture d'exploration (14) comporte des ouvertures séparées, utilisables proportionnellement et variables pour la capture d'images et ladite étape de détection.

16. Méthode selon la revendication 12, dans laquelle ladite étape de commande comprend l'arrêt de ladite unité de flash (22) aussitôt qu'une quantité prédéterminée d'énergie du spectre infrarouge est captée lors de l'illumination par l'unité de flash.

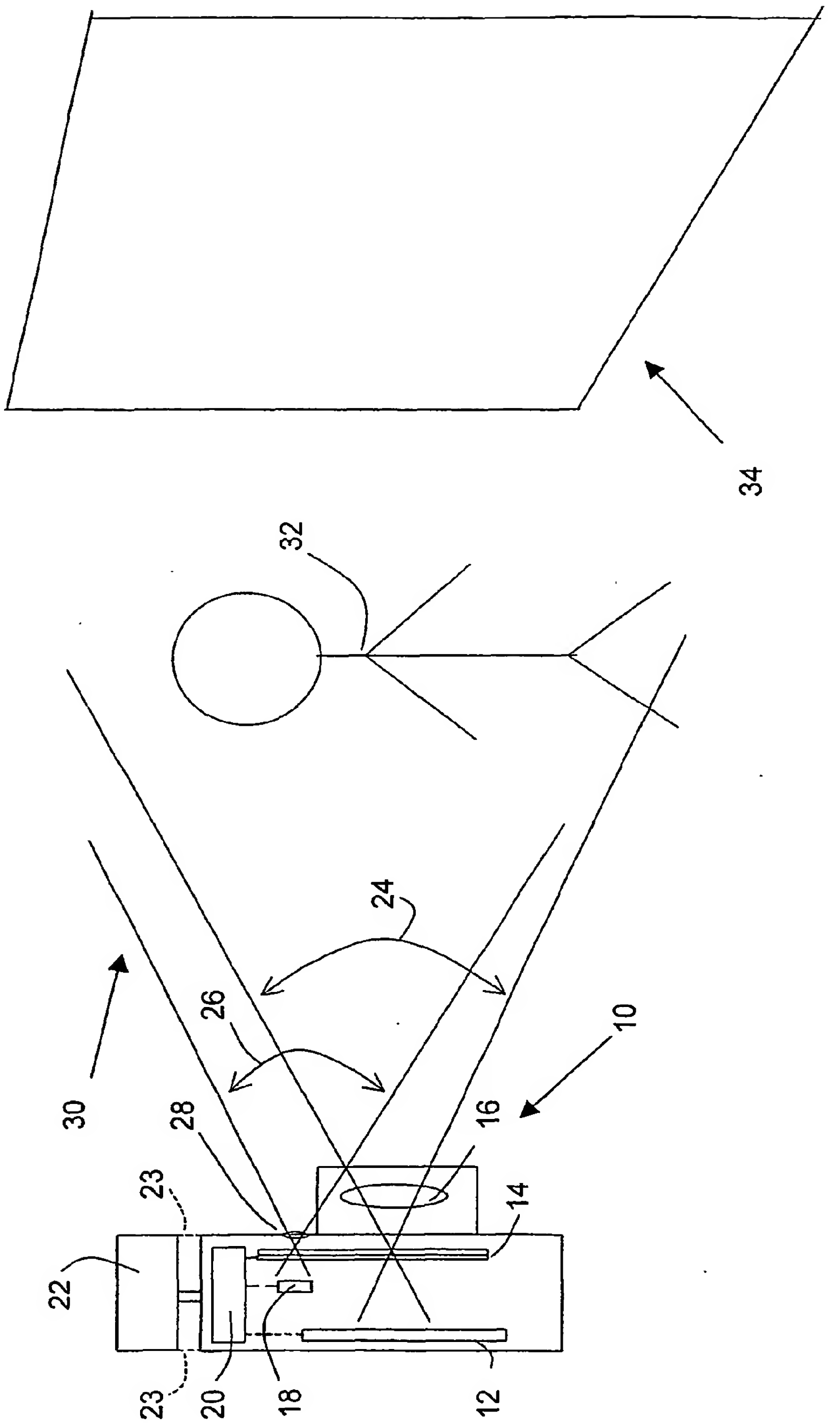

Fig. 1

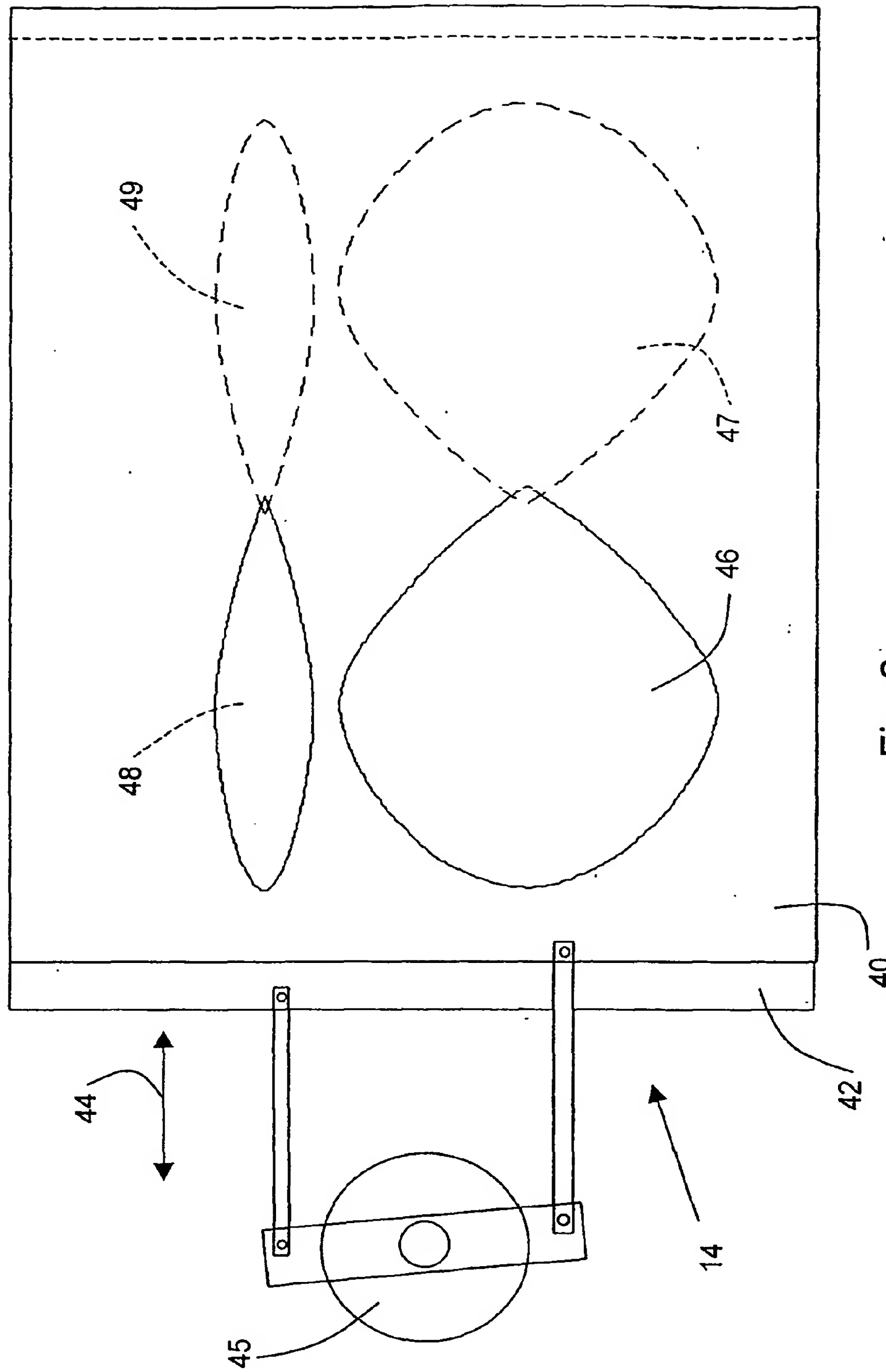

Fig. 2

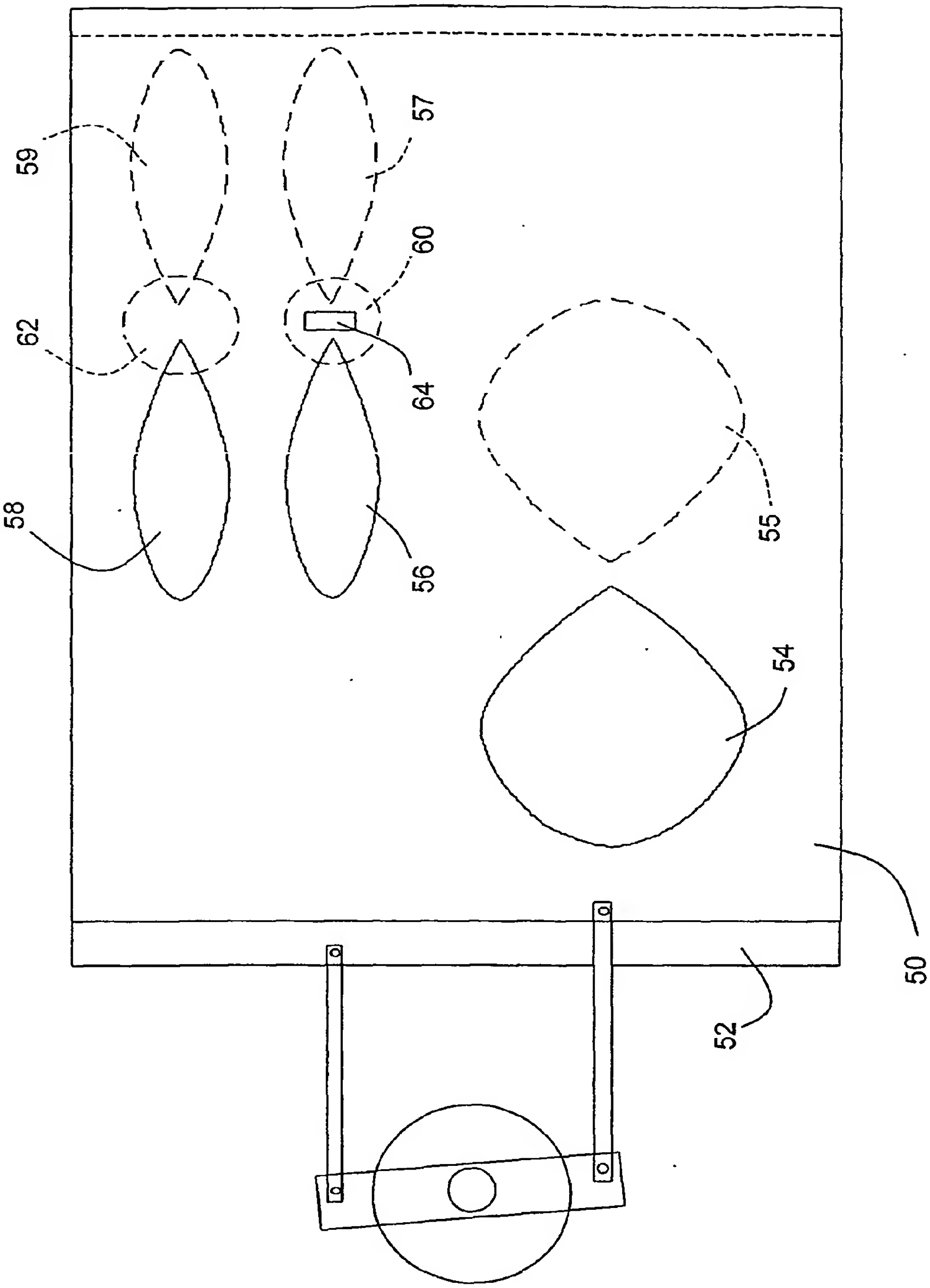

Fig. 3

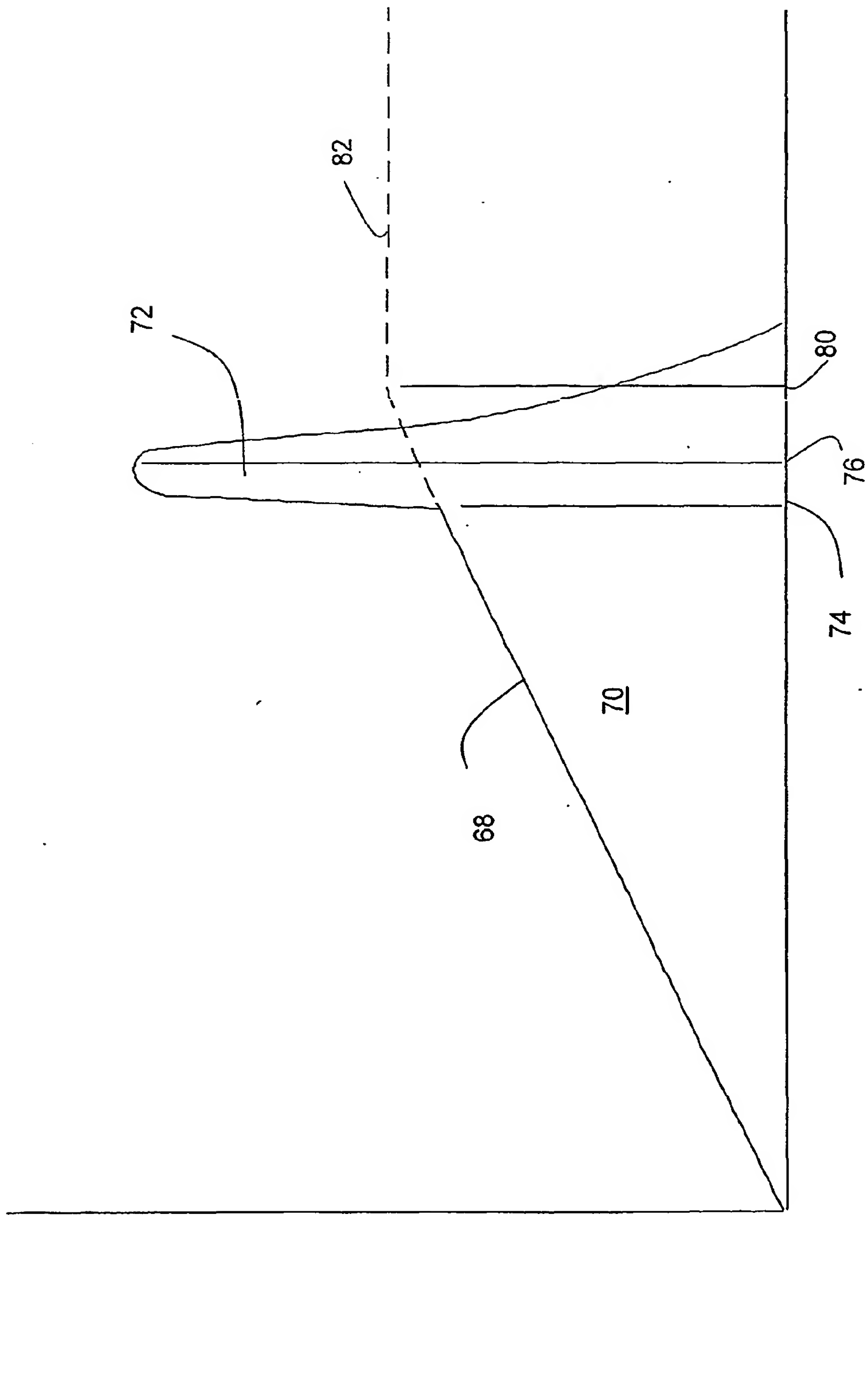

Fig. 4